

California Regional Water Quality Control Board  
Santa Ana Region

June 01, 2001

ITEM: 18

SUBJECT: Supplemental Guidance for the Prioritization of Investigation and Cleanup of Underground Storage Tank Releases Containing MtBE

DISCUSSION:

Recent drinking water well sampling in Orange County and elsewhere in Southern California has demonstrated that drinking water systems are occasionally affected by chemicals from petroleum releases from underground storage tanks (USTs), these releases can threaten the long-term beneficial uses of the groundwater. Specifically, the introduction of the fuel oxygenate methyl *tert* butyl ether (MtBE) has increased the threat from gasoline releases from USTs.

On January 26, 1996, the Santa Ana Regional Water Quality Control Board issued local guidance regarding the use of risk-based strategies in the regulation of leaking underground fuel tanks, which included the stipulation that “the presence of MtBE ... would not allow for the designation of a site as ‘low-risk’”. Since that time, the growing awareness of the presence of significant levels of MtBE in the groundwater beneath the majority of USTs in our Region and the associated threat to our groundwater resources and municipal supply wells have prompted Board staff to additional guidance.

This guidance document is intended to assist managers and staff at state and local regulatory agencies in the Santa Ana Region with the task of overseeing the investigation and cleanup of UST sites where there have been releases of MtBE-laden gasoline. This document has been drafted to supplement the site classification in the Final Draft Guidelines for the Investigation and Cleanup of MtBE and Other Ether-Based Oxygenates, dated March 27, 2000, from the State Water Resources Control Board.

The supplemental guidance document presents a site priority classification that considers a site’s contaminant concentration and other factors to identify those sites most likely to cause impacts to sensitive groundwater resources. It then specifies, for each priority classification, the site characterization activities and remedial objectives that should be completed within specified time periods, and the conditions that need to be satisfied for a particular site classification to successfully proceed to closure. Sites that are situated close to active water supply wells are given the highest priority for cleanup.

## Memorandum

To: Santa Ana Region Underground Storage Tank  
Local Oversight Program Agencies and Other Interested Parties

Subject: Supplemental Guidance for  
Prioritization of Investigation and Cleanup of  
Underground Storage Tank Releases Containing MtBE

The following guidance document is intended to provide specific assistance to regulatory agencies in the prioritization of the investigation and cleanup of petroleum release sites from underground storage tanks within the Santa Ana Region. This guidance document is intended to assist regulatory staff in the appropriate and consistent response to the release of petroleum especially if methyl *tert*-butyl ether, (MtBE), is involved.

A principal function of the Water Board's regulatory program is the maintenance of a water body's ability to support present and potential future beneficial uses. From a water quality maintenance perspective, the main goal of site cleanup is the eventual restoration of the beneficial uses of the water within a reasonable period of time (i.e., by the time the water has the probability of being used beneficially). The Regional Water Boards have flexibility in establishing timeframes for aquifer restoration so long as the achievement of the objective occurs within a time period that is consistent with beneficial use patterns.

Within the Santa Ana Region, the concern over long-lasting chemicals released into the groundwater is well founded and stems directly from our combination of population and geology. In this region of California, a large and increasing dependence on water supply derived from groundwaters, a large urban area, and a relatively transmissive aquifer combine to create a situation where the groundwater resources are both highly valued and susceptible to contamination. This combination, in turn, causes our policy decisions to place a greater emphasis on the protection and restoration of the groundwater in our Region. Recent drinking water well sampling in Orange County and elsewhere in Southern California demonstrates that chemicals released into the shallow portions of the aquifer threaten the drinking water supplies. The cumulative effect of thousands of releases from petroleum USTs throughout the Region poses a threat to the beneficial uses of the aquifers which warrants characterization and, where necessary, the appropriate cleanup of these releases.

Due to the above factors, it is our position that remediation of petroleum release sites should be conducted, where appropriate, to reduce risks associated with the release. These risks may be in the form of:

1. Threats to public safety through either fire or explosive vapor hazard,
2. Threats to public health through excessive lifetime cancer risk (i.e., from benzene vapor),
3. Threats to the long-term maintenance of the beneficial uses of water resources, and
4. Threats to ecological receptors.

If the threat posed by the release is in the form of a fire or an explosive hazard, or as an acute threat to human health through exposure to vapors, remediation of this type of threat should be immediate and the primary goal of the responsible party. Subsequent to the evaluation and resolution of the immediate threat, the site conditions should be evaluated with respect to the threat to municipal

supply wells, the preservation of designated beneficial uses of groundwater or as a threat to ecological receptors. This group of cases is the focus of this guidance document.

In the past several years, there have been several factors that have altered the perception of the threat posed by petroleum releases. First among these was the incorporation of the process of biological degradation of organic compounds in the subsurface. This was prompted by the release of the first Lawrence Livermore UST study which led to the development of “low-risk” guidance from the State and Regional Water Boards to promote the passive management of cases that posed little risk of aquifer impairment. Specifically, on January 26, 1996, the Santa Ana Regional Water Quality Control Board approved local guidance regarding the regulation of leaking USTs which, among other things, established a closure goal for benzene in groundwater of 250 parts per billion. That Santa Ana Region guidance also included the stipulation that “the presence of MtBE ... would not allow for the designation of a site as “low-risk”.

Since that time, the growing awareness of the presence of significant levels of MtBE in the groundwater beneath the majority of USTs in our Region and the threat to our groundwater resources and municipal supply wells has prompted the Santa Ana Region to develop this guidance document. Due to chemical properties of MtBE, it is this Regional Board’s position that the bulk of the MtBE-containing petroleum that is causing ongoing groundwater contamination beneath USTs should be cleaned up in order to maintain long-term aquifer and basin viability in the most cost-effective manner.

In general, our approach to the cleanup of UST releases that overlie drinking water aquifers will be to achieve the greatest degree of appropriate risk reduction economically possible. This position means the contaminant mass reduction is typically the solution to UST releases. Also included in this position is the view that “low-risk” situations can be monitored to confirm degradation through natural processes. This point applies to cases where only low levels of contamination are observed as either the maximum levels ever seen at the site or as the levels that remain after a degree of remediation has been completed.

The attached guidance document presents a site priority classification that considers a site’s maximum contaminant concentration to identify those sites most likely to cause impacts to sensitive groundwater resources. Increased priority is given to those sites within 2000 feet of an active drinking water well. It then specifies, for each priority classification, the site characterization activities and remedial objectives to be completed within specified time periods and the conditions that need to be satisfied for a particular site classification to successfully proceed to closure.

Any comments or questions as to how to use this guidance document should be addressed to Kenneth Williams, Chief of the Pollutant Investigation Section, at (909) 782-4496. Comments may be sent to Mr. Williams via conventional mail or e-mail ([ustguidance@rb8.swrcb.ca.gov](mailto:ustguidance@rb8.swrcb.ca.gov)).

Sincerely,

Gerard J. Thibeault  
Executive Officer

Attachment: “Supplemental Guidance for Prioritization of Underground Storage Tank Cases, with Specific Recognition of the Threat Potential from Fuel Oxygenates”

**California Regional Water Quality Control Board  
Santa Ana Region**

**Supplemental Guidance for  
Prioritization of Investigation and Cleanup of Underground Storage  
Tank Releases Containing MtBE**

**Introduction**

Local agencies implementing the Underground Storage Tank (UST) Program and other interested parties have requested guidance for the prioritization of gasoline release cases containing methyl *tert*-butyl ether (MtBE) in the Santa Ana Region. This guidance document is intended to assist managers and staff at state and local regulatory agencies in the Santa Ana Region with the task of overseeing the investigation and cleanup of sites where there have been releases of MtBE-laden gasoline. This document is intended to supplement the site classification in the Final Draft Guidelines for the Investigation and Cleanup of MtBE and Other Ether-Based Oxygenates, dated March 27, 2000, from the State Water Resources Control Board.

The purpose of this guidance document is to describe a standardized and effective approach for dealing with petroleum releases containing fuel oxygenates, such as MtBE. Unlike traditional petroleum constituents, MtBE moves quickly and is slow to degrade in the subsurface environment. In order to avoid costly impacts to municipal supply wells and valued aquifers, a quick response to the release is critical in order to check the spread of the contaminants both horizontally and vertically. Although this is a guidance document and the timelines included here are not mandatory, Board staff believes that these criteria identify an appropriate response to sites where MtBE is present. Regulators will need to prioritize their cases and give greatest oversight to those sites that pose the greatest risk to the groundwater.

**Background**

California's Underground Storage Tank (UST) Program, in existence since 1984, was established to address the large number of UST releases. These sites, where generally unknown quantities of gasoline were released into the underlying soils and groundwater, were threatening drinking water supplies.

The addition of a group of fuel additives called oxygenates, such as MtBE, to gasoline supplies throughout the state at various times over approximately the last fifteen years has increased the potential for long-term drinking water impairment. The threat from MtBE to the drinking water resources of a community reliant on groundwater is much greater than that from other petroleum compounds. The finding of significant levels of MtBE in the

soils and groundwater beneath the majority of gasoline stations in the Santa Ana Region prompts a heightened level of concern for our groundwater resources.

In order to ensure that remediation begins quickly at sites with significant levels of MtBE (or benzene, when appropriate), this guidance document incorporates recommended time frames for the completion of plume characterization activities and the actual start-up of remedial actions. Application of these time frames to individual cases will require the consideration of site-specific extenuating circumstances, such as property access issues.

### **Classification of Sites by Threat**

Gasoline release sites may create a variety of threats to the environment. These guidelines, however, prioritize sites based solely on threats to groundwater resources. Regulators may need to modify a site's priority based on other environmental threats.

Within the Santa Ana Region all groundwater subbasins are designated as drinking water sources and all releases that affect groundwater should be considered threats to drinking water supplies. Therefore, these guidelines do not prioritize sites based solely on the distance of the site from existing drinking water supply wells. However, if a UST site is situated relatively close to an active drinking water supply well, the potential threat the site could pose would be increased.

Thus, the threat to the groundwater resources' long-term beneficial uses from a particular UST release site is significantly influenced by the mass of contaminant released. The highest observed concentrations of MtBE in groundwater at the site and the persistence of such levels can be utilized as a data surrogate for actual contaminant mass released. Additionally, elevated priority must be given to UST sites with severe MtBE contamination that are also close to active drinking water wells.

### **Classifications**

The following classifications have been generally developed based on the criteria discussed above. Priority for case oversight and remedial action will be in order from Class I to Class IV. The appropriate degree and pace of the remedial response for the different classes are addressed in the following text.

#### **Groundwater Cases**

<b>Site Conditions</b>	<b>Class</b>
Free Product (Gasoline)	Class I
>50,000 ppb MtBE, & less than 2000 feet from an active drinking water well	Class I
>50,000 ppb MtBE, & greater than 2000 feet from an active drinking water well	Class II
500 to 50,000 ppb MtBE	Class II
Less than 500 ppb MtBE	Class III

### **Other Types of Cases**

Soils Only Cases	Class IV
Releases not overlying sources of drinking water	Class IV

*If the site conditions are such that these classifications are considered by the responsible party to be overly stringent, alternative methods of classifying a particular site may be proposed to the overseeing agencies for consideration.*

For sites that involve other types of petroleum hydrocarbons, such as diesel fuel, the appropriate response should be developed through discussion with the overseeing agency.

At this time, the oxygenate being most widely utilized by oil companies and being observed at gasoline release sites is MtBE. Other oxygenates, such as tert-butyl alcohol (TBA), are being observed at a number of sites at significant concentrations. The expected approach to the quantification of compounds other than MtBE is the application of a more exact chemical analysis, EPA Method 8260B, in order to quantify and monitor gasoline release sites for the presence of the various chemicals in gasoline. As more data are gathered regarding the presence of other chemicals of concern, additional guidance may be developed.

*With regard to the vertical definition of groundwater impacts, it is expected that an appropriate degree of prudent and cautious exploration would be performed in order to avoid creating avenues for contamination to migrate. This would necessitate a progressive approach that would assess vertical gradients and chemical patterns in areas away from the contaminant source.*

The following is a discussion of the descriptions and activities for each of the proposed classifications.

### **Class I Sites (Highest Priority)**

Class I sites are those groundwater cases which have either one of two conditions. These sites have either:

- a maximum MtBE concentration above 50,000 parts per billion *within 2000 feet of an active drinking water well*, or
- free gasoline product floating on the watertable.

This designation can also be applied to sites in proximity to a drinking water supply well that is affected by gasoline-related contaminants.

The following regulatory actions are appropriate for Class I sites:

1. Require immediate identification and control of the source of the gasoline leakage.
2. Require definition of the lateral extent of the plume within six months.  
(Extensions may be granted if access to adjacent properties is necessary.)

- (The plume definition activities should *be able to approximate* the 5 ppb. MtBE contour line.)
3. Require definition of the vertical extent of the plume within twelve months. (Extensions may be granted if access to adjacent properties is necessary.) (The plume definition activities should *be able to approximate* the 5 ppb. MtBE contour line.)
  4. Require a survey of all drinking water sources within a one-mile radius during the first three months.
  5. Require the submittal of quarterly groundwater monitoring reports.
  6. Require timely initiation of the remediation of the core portion of the groundwater plume. This should include the submittal of an Interim Remedial Action Plan within two months and its implementation within three months of its approval.
  7. Require the initiation of soil remediation within one year. Soil remediation should continue until soils no longer act as a source of groundwater contamination.
  8. Require the remediation of any remaining groundwater contamination (final remediation goals should be based on State Board Resolution No. 92-49).
  9. Require the installation of a sentinel well(s) within one year to monitor plume migration. \*
  10. Report all monitoring and remedial activities on a quarterly basis.

\* Regulatory agency staff may waive this item, if appropriate.

## **Class II Sites**

Class II sites are those groundwater cases which have either:

Maximum MtBE concentrations above 50,000 ppb. and are more than 2000 feet from an active groundwater supply well, or maximum MtBE concentrations between 500 and 50,000 ppb.

The following regulatory actions are appropriate for Class II sites:

1. Require immediate identification and control of the source.
2. Require definition of the vertical and lateral extent of the plume within eighteen months. (Extensions may be granted if access to adjacent properties is involved.) (The plume definition activities should *be able to approximate* the 5 ppb. MtBE contour line.)
3. Require a survey of all drinking water sources within a one-mile radius during the first six months. \*
4. Require the submittal of quarterly groundwater monitoring reports.
5. Require timely initiation of remediation of the core portion of the groundwater plume. This should include the submittal of an Interim Remedial Action Plan within two months and its implementation within three months of its approval. \*(Extension of these time frames may be granted based on site-specific factors.)
6. Require the initiation of soil remediation within two years. Soil remediation should continue until soils no longer act as a source of groundwater contamination.

7. Require the remediation of any remaining groundwater contamination. (Final remediation goals should be based on State Board Resolution No. 92-49.)
8. Report all monitoring and remedial activities on a quarterly basis. \*

\* Regulatory agency staff may waive these items, if appropriate.

### **Class III Sites**

Class III sites are those groundwater cases with maximum MtBE concentrations below 500 parts per billion. These cases have usually unknown quantities of gasoline released into the subsurface soils with relatively minor groundwater impacts.

For Class III sites, a site characterization process should include:

1. Adequate vertical and lateral definition of the extent of soil contamination,
2. Identification of any groundwater impacts,
3. Definition of the lateral extent of groundwater contamination, if necessary
4. Submittal of quarterly groundwater monitoring sampling reports, if necessary
5. Adequate remediation of soil contamination, and
6. Regular reporting of data gathering and remedial activities.

The contaminated soils should be remediated to the point that they can no longer act as a source of groundwater contamination. This remediation should typically be in the form of limited-volume soil excavation or limited-term soil vapor extraction. Following remedial activities, confirmation borings and/or groundwater monitoring will serve to verify sufficient contaminant removal.

### **Class IV Sites**

Class IV sites are those gasoline releases in which only soils have been confirmed to have been affected, or those located in areas which overlie groundwater which does not meet the definition of a source of drinking water.

For Class IV sites, the site characterization process should include:

1. Adequate vertical and lateral definition of the extent of soil contamination,
2. Identification of any groundwater impacts,
3. Definition of the lateral extent of groundwater contamination, if necessary,
4. Submittal of quarterly groundwater monitoring sampling reports, if necessary,
5. Adequate remediation of soil contamination, if necessary, and
6. Regular reporting of data gathering and remedial activities.

As with Class III sites, the contaminated soils at Class IV sites should be remediated to the point that they can no longer act as a potential source of groundwater contamination. However, the remedial actions at some Class IV sites may differ from those appropriate for Class III sites (i.e., prevention of groundwater impacts) in that the degree of soil cleanup required may be based on the actual or anticipated land use for protection of



human health. Regulatory staff will determine the appropriate oversight and degree and pace of cleanup on a case-specific basis.